ance of the spectrum is very much like that of *Nova Geminorum* on March 18, 1912, the date previously referred to.

The continuous spectrum which characterized the rise to maximum contained numerous strong dark lines, and furnishes a most remarkable example of what may perhaps be called the typical dark line nova spectrum. The resemblance to the spectrum of *α Cygni*, remarked in previous novae by other observers, is more striking than was the case with *Nova Aquilae*, or in fact with any nova that has come under my observation. The stellar lines are, as usual, displaced in the nova to correspond with the dark hydrogen lines. The line absorption overlies the hydrogen emission bands.

The dark line spectrum has, in previous novae, characterized an early period, an interval close to the outbreak of the star, and has been followed by the so-called "bright-band" stage. The reversion to the earlier type, in the present instance, coincident with the rise to second maximum suggests that the forces which act to produce a nova were called into play a second time.

The spectrum of this star offers the possibility of determining with a great degree of certainty the constituents of the atmospheres of new stars. It ranks in interest with those of the brighter novae of recent years.

W. H. WRIGHT.

COMET NOTES

The Brorsen-Metcalf comet, known earlier as Metcalf's first comet of 1919, passed perihelion on October 16th. It is now in the morning sky, having passed the Sun, and it is moving southward. By the first of November it was difficult for northern observers, because of the nearness to the Sun, and the southern declination. Two observations were secured, however, at the Lick Observatory on November 3rd and 4th.

These two positions indicate that the elements given in *Lick Observatory Bulletin* No. 324 are quite close to the truth, for the observations are represented within the numerical accuracy of the ephemeris. It appears that the period of 72.1 years will not be much changed by any increase in observational data. In this connection an announcement emanating from the Copenhagen computers is of interest. They have obtained an orbit with a period of only 42 years, so that it seemed likely that there had been two

revolutions since 1847, instead of but one. Inasmuch as this orbit shows considerable deviation from observation on November 3rd and 4th, the correctness of this short period seems very doubtful. Not improbably the Copenhagen orbit of 42-year period suffers from some inaccuracy of observation. The orbit by the same computers from different observations, and with a shorter arc, with period assumed as 72.095 years, is quite close to the one by the writer, and it represents the observations better than does the unconditioned 42-year ellipse. A characteristic feature of the orbits for comets of long period derived from observations extending over but one apparition is the indeterminateness of the calculated periods. A parabolic orbit is found in the case of this comet to represent observations over a considerable interval with an accuracy not much less than that of the conditioned ellipse. This comet affords a good example of the manner in which the accuracy of the elements and consequently of the ephemeris may be increased, when moderate time intervals are used, by assuming an approximately known period.

On October 25th another comet was discovered in Japan by Sasaki of the Kyoto Observatory. The cabled announcement was delayed some days, and by the time it reached American observers the Moon had moved close to the given position. On November 9th the Moon had moved away sufficiently and the object was found by Fayet at Nice. It was first observed at Mt. Hamilton on November 12th. It is diffuse, condensed in the center, with the suggestion of a nucleus. Schaumasse has identified this comet with Finlay's periodic comet, one of short period which has been observed repeatedly at returns since 1886. The identification is without doubt correct, for while the observed position differs by almost three hours and a half in right ascension, and eleven degrees in declination from the position calculated from Fayet's elements for 1913, an empirical change of the perihelion time of only eight days, to October 15th, results in a reasonably close agreement of theory and observation. Such a change is justifiable, for the difference may easily be accounted for by the action of planetary perturbations. It is to be expected that further calculation will confirm the identification.[1] Assuming an identity with Finlay's

[1]November 18th. Elements for this comet, computed by Professor Crawford and Miss Fairfield and Miss Cummings at the Students Observatory, Berkeley, have just been received. As was anticipated, these elements place the identity of this object and Finlay's periodic comet beyond question. The revolution period is 6.1 years and the object belongs to the well-known *Jupiter* comet family.

comet, it is found that the object is quite close to the Earth (on November 12th) astronomically speaking, for it is but a fifth of an astronomical unit, or roughly 19,000,000 miles away.

On October 31st announcement was made thru the Harvard College Observatory that a comet was observed by Fayet on October 29th. This is supposed to be the periodic comet first found by Schaumasse in 1911, the return of which has been expected. There is a larger discrepancy of the observed position from the ephemeris by Fayet and Schaumasse than would naturally be anticipated. There is but the one observation by Fayet so far at hand. The comet is difficult to observe, for it is low in the morning sky, near the Sun, and quite faint.

November 17, 1919. H. M. JEFFERS.

NEW INFRA-RED LINES IN THE SOLAR PROMINENCE SPECTRUM

The solar prominence spectrum was photographed in the region 6500A to 9200A. The apparatus used was the 36-inch refractor and the grating spectrograph described by Campbell and Albrecht in *Lick Observatory Bulletin*, **6**, 11, 1910. The second order of the grating was used thruout, the scale being about 10.5A per millimeter. The resolving power was in the neighborhood of 90,000. The photographic plates were sensitized by means of dicyanin kindly furnished by the Bureau of Chemistry (Washington).

In the visual region only the well-known bright lines hydrogen Hα, helium D_3, and helium 7065A were recorded. The known helium line at 6678A was too faint to be photographed in the half-dozen prominences which were observed. The line at 7065A, on the other hand, was always found to be very strong, showing the same distribution of intensity as Hα and D_3. The different behavior of these two helium lines is of considerable interest and would seem to deserve further study, in spite of the large number of visual observations which have been made on them. The line at 7065A has usually been characterized as "weak" by visual observers, but photographically with dicyanin it is strong, rivalling D_3.

In the region of wave-lengths longer than 7065A no prominence line was found until the calcium triple beginning at 8498A was reached. Of these three lines, the second, at 8542A, is always easily photographed; the third, at 8662A, is usually strong enough